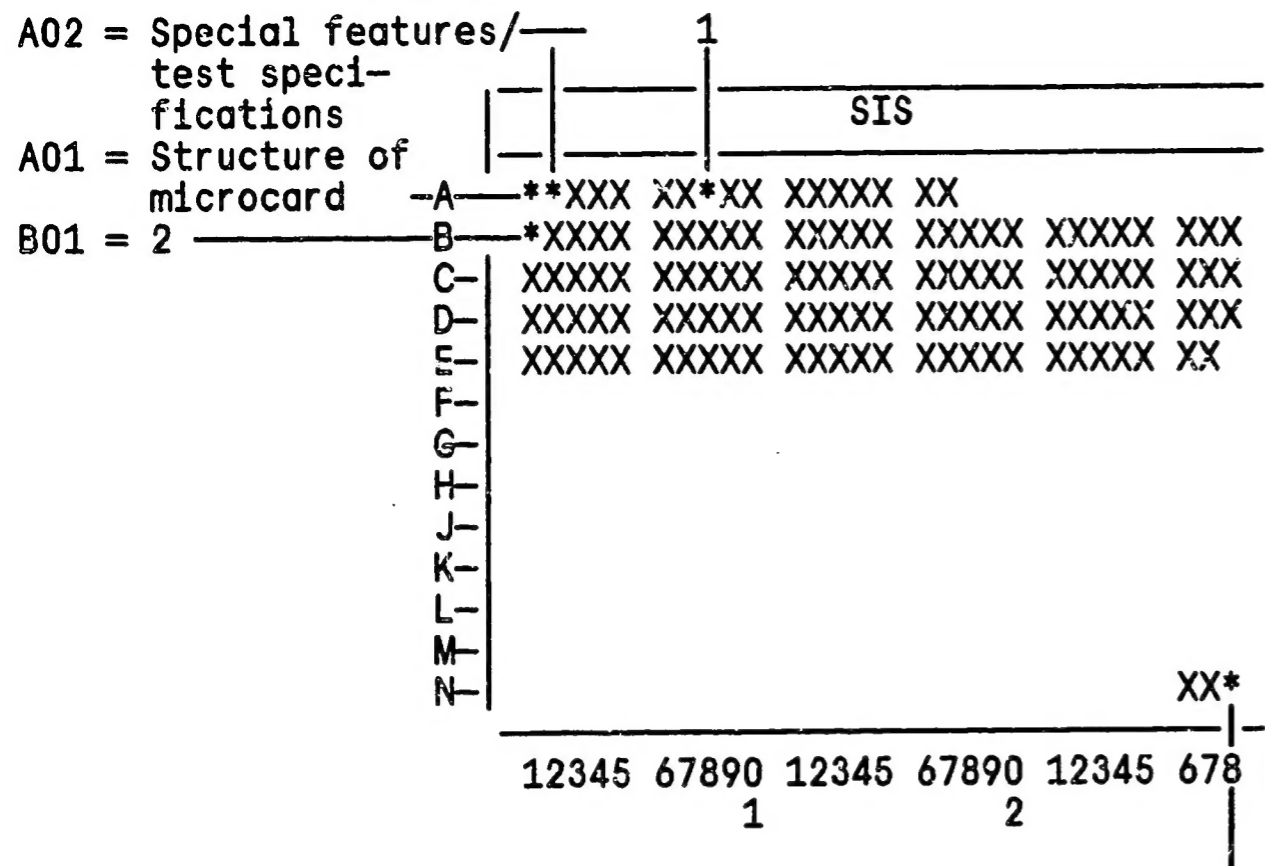


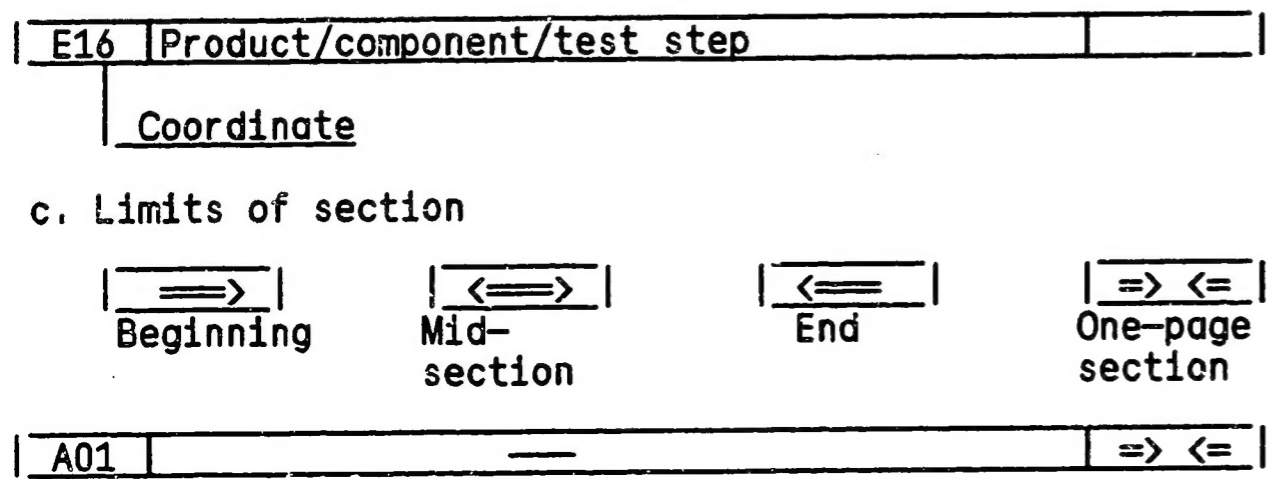
# STRUCTURE OF THE MICROCARD



N28 = Table of contents and publication information

- 1 = Tools and devices
- 2 = Complete instructions, divided into test steps (no references)

- a. Read from left to right.
- b. Title of micropicture (appears on each coordinate).



# SPECIAL FEATURES

These instructions describe the testing of series RQ..FA..K governors.

## TEST BENCHES, TEST EQUIPMENT AND INSTRUCTIONS FOR THE TESTING OF FUEL-INJECTION PUMPS

- 1.1 General
- 1.2 Test specifications

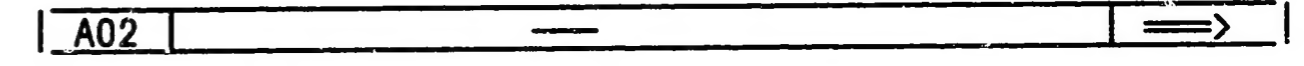
The test specifications for fuel-injection equipment are contained in the test specifications of the microcards WP.. (Table of Contents WP-00 or WP-01). The general test specifications for governors and timing devices alone are listed in the microcards WP-451 to WP-453.

### 1.3 Calibrating oil

The calibrating oil must be in line with ISO Standard 4113. It must not be mixed with lubricating oil or diesel fuel and it must not be contaminated, since this influences the test specifications. It is likewise forbidden to mix ISO calibrating oils from various manufacturers and to add kerosene or diesel fuel to calibrating oil. The prescribed calibrating-oil temperature for in-line pumps is 38...42° C in the inlet.

### Viscosity test:

- Tester KDEP 1500 comprising:
- \* Vessel with cover
  - \* Thermometer with protective conduit and holder
  - \* Viscosity cup
  - \* Stopwatch (not part of scope of delivery).



Test intervals (depending on degree of utilization of test bench)

- \* 1x per week (in accordance with ISO Specification 4008/III)
- \* At the latest after testing 20 fuel-injection pumps or after approximately 35 hours of operation.
- \* However after a maximum of six months if no or fewer than 20 fuel-injection pumps have been tested in the intervening period.

#### Preparation

Fill vessel up to approximately 3/4 mark with filtered calibrating oil from test-bench inlet line. Pay particular attention to cleanliness. Even minute dirt particles (e.g. fluff in the vessel) can bias the measurement result.

Attach thermometer with protective conduit to inside of vessel. Immerse viscosity cup in calibrating oil and leave in calibrating oil for some 15 minutes. This makes for temperature equalization between the viscosity test cup and the calibrating oil.

#### Test procedure

Steadily (within approx. 1 second) pull viscosity cup out of calibrating oil by means of chain (do not allow to swing, keep steady, avoid spillage).

Start stopwatch as soon as viscosity cup emerges from calibrating oil.

When calibrating oil enters inside of cup bore from funnel-shaped part of cup, press stopwatch again, read off efflux time and note it down. Repeat viscosity test until identical measurement result (tolerance  $\pm 0.3 \text{ mm}^3/\text{s}$ ) is attained.

If the same measurement result has not been obtained after repeating the procedure for the fourth time, the viscosity cup, vessel or calibrating oil (filter in test bench) is in some way contaminated (e.g. fluff). Refer to "Preparation" section. The test is then to be repeated again as described. Compare measurement result to the values given in the table.

Oil temperature (in ° C)	Permitted efflux time (sec.)
10	82.0 - 89.5
11	81.0 - 88.5
12	80.5 - 87.5
13	80.0 - 86.5
14	79.0 - 86.0
15	78.5 - 85.0
16	78.0 - 84.0
17	77.5 - 83.0
18	77.0 - 82.0
19	76.5 - 81.5
20	75.5 - 80.5
21	75.0 - 79.5
22	74.5 - 79.0
23	74.0 - 78.0
24	73.5 - 77.5
25	73.0 - 77.0
26	72.5 - 76.0
27	72.0 - 75.5
28	71.5 - 75.0
29	71.0 - 74.5
30	70.5 - 74.0
31	70.0 - 73.5

Viscosity test (continued)

Oil temperature (in ° C)	Permitted efflux time (sec.)
32	69.5 - 73.0
33	69.0 - 72.5
34	68.5 - 72.0
35	68.2 - 71.5
36	67.8 - 71.0
37	67.5 - 70.5
38	67.0 - 70.0
39	66.5 - 69.5
40	66.0 - 69.0

If the measured time is outside the permitted efflux-time tolerance, the calibrating oil and the calibrating-oil filter in the injection-pump test bench are to be replaced.

Cleaning of viscosity cup:

Do not clean inside of viscosity cup by polishing it, but rather wash it out with benzine after testing, so as to avoid resin residues in the efflux hole.

**N e v e r** clean the efflux hole with a needle, since scoring in the hole will bias the measurement result by changing the flow conditions.

1.4 Condition of test equipment

Check injection pressure of calibrating nozzle-holder assembly and condition of nipples of test-pressure lines (use plug gauge) once a week, however at the latest after testing 20 fuel-injection pumps!

If necessary, adjust opening pressure of nozzle-holder assemblies and repair/renew discharge tubing.

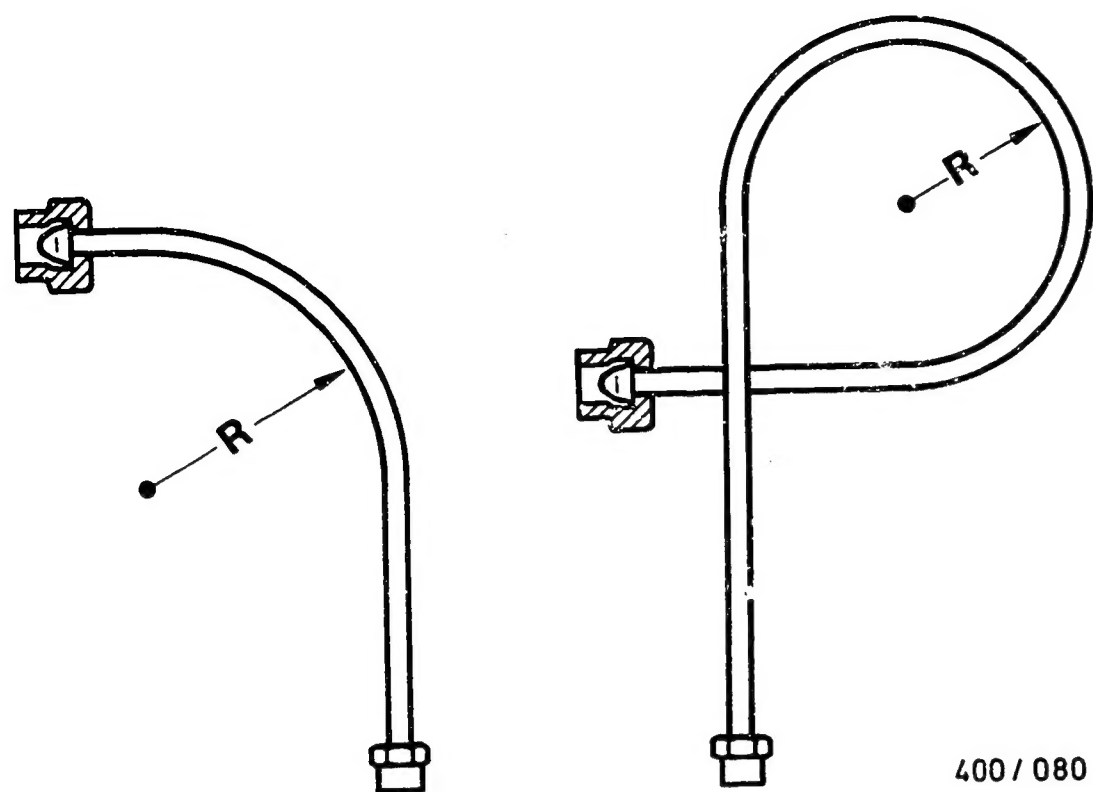
1.5 Test equipment required

The settings and check values outlined in the test specifications refer to precisely defined test equipment prescribed for each pump. The most important components of the test equipment are as follows: calibrating nozzle-holder assembly and test-pressure line. Possible variations on such test equipment are given in the index microcard W-400/000 and are arranged according to pump types. Test-pressure lines and calibrating nozzle-holder assemblies prescribed for the respective type of pump are always given first. (Not indicated on older test-specification sheets). Varying test-equipment possibilities are indicated below.

1.6 Pump test bench

The test equipment also contains a list of permitted test-bench types for each size of pump. Non-compliance with this specification results in totally incorrect settings and/or wrong test results.

Types of test bench not indicated are not permitted!



400 / 080

Permitted minimum bending radii for test-pressure lines:

OD mm	Wall thickness mm	Radius R mm
6	2.0	16
6	1.5	25
8	2.5	50
8	2.0	50

In order to avoid vibration, the clip (part number 1 682 386 002) is to be used in the case of lines longer than 600 mm.

### 1.7 Test conditions

In order to attain the prescribed values during pump adjustment or pump checking, the test conditions for the various pump sizes, as listed on the test-specification sheet, are to be precisely observed, particularly as regards inlet pressure and, if stated, a special overflow valve for suction-gallery flushing.

### 1.8 Notes on setting prestroke

The following applies to all in-line pumps:

The prestroke has been attained when the flow of calibrating oil at the overflow pipe of the calibrating nozzle-holder assembly becomes a chain of droplets.

### 1.9 Delivery measurement

The delivery indicated in the test specifications is the average of all individual quantities determined.

At the same time, a check is to be made to establish whether the permitted scatter in the test specifications is exceeded.

The scatter refers to the difference in quantity between the maximum and minimum delivery.

Example :

Prescribed delivery = 12.1...12.3 cm<sup>3</sup> /100 strokes

Permitted scatter = 0.3 cm<sup>3</sup> /100 strokes

Barrel Number	1	2	3	4	5	6	Average
Delivery	12.4	12.2	12.5	12.3	12.5	12.4	12.38

Determined scatter: 12.5...12.2 = 0.3 cm<sup>3</sup> /100 strokes  
 This setting is not permitted; the average of all barrels is not between 12.1 and 12.3 cm<sup>3</sup> /100 strokes.

Barrel Number	1	2	3	4	5	6	Average
Delivery	12.4	12.2	12.0	12.3	12.1	12.4	12.23

Determined scatter: 12.4...12.0 = 0.4 cm<sup>3</sup> /100 strokes  
 This setting is not permitted; the scatter is greater than 0.3 cm<sup>3</sup> /100 strokes.

Barrel Number	1	2	3	4	5	6	Average
Delivery	12.4	12.2	12.2	12.3	12.1	12.4	12.26

Determined scatter: 12.4...12.1 = 0.3 cm<sup>3</sup> /100 strokes  
 This is a permitted setting.

\* Moisten inside of graduates prior to each measurement.  
 Allow calibrating oil to run in and graduates to drip off for 30 ± 1 s.

\* Allow graduates to discharge for 30 ± 1 s after each measurement and prior to commencement of new measurement. Wet graduates again if the interval following discharge is more than 10 minutes.

\* Heating coil must not be switched on when performing measurement.  
 On reading off the delivery, there must be no bubbles in the graduates on the surface of the calibrating oil.  
 Take reading at refraction at blue stripe on graduate.

\* Keep the calibrating-oil temperature constant within the specified tolerances during pump measurement.

In-line pumps 38...42° C in inlet

1.10 Test benches and test equipment assigned to types of fuel-injection pump

Test benches and test equipment are assigned to types of fuel-injection pump in the index micro-card W-400/000

2. TIGHTENING TORQUES

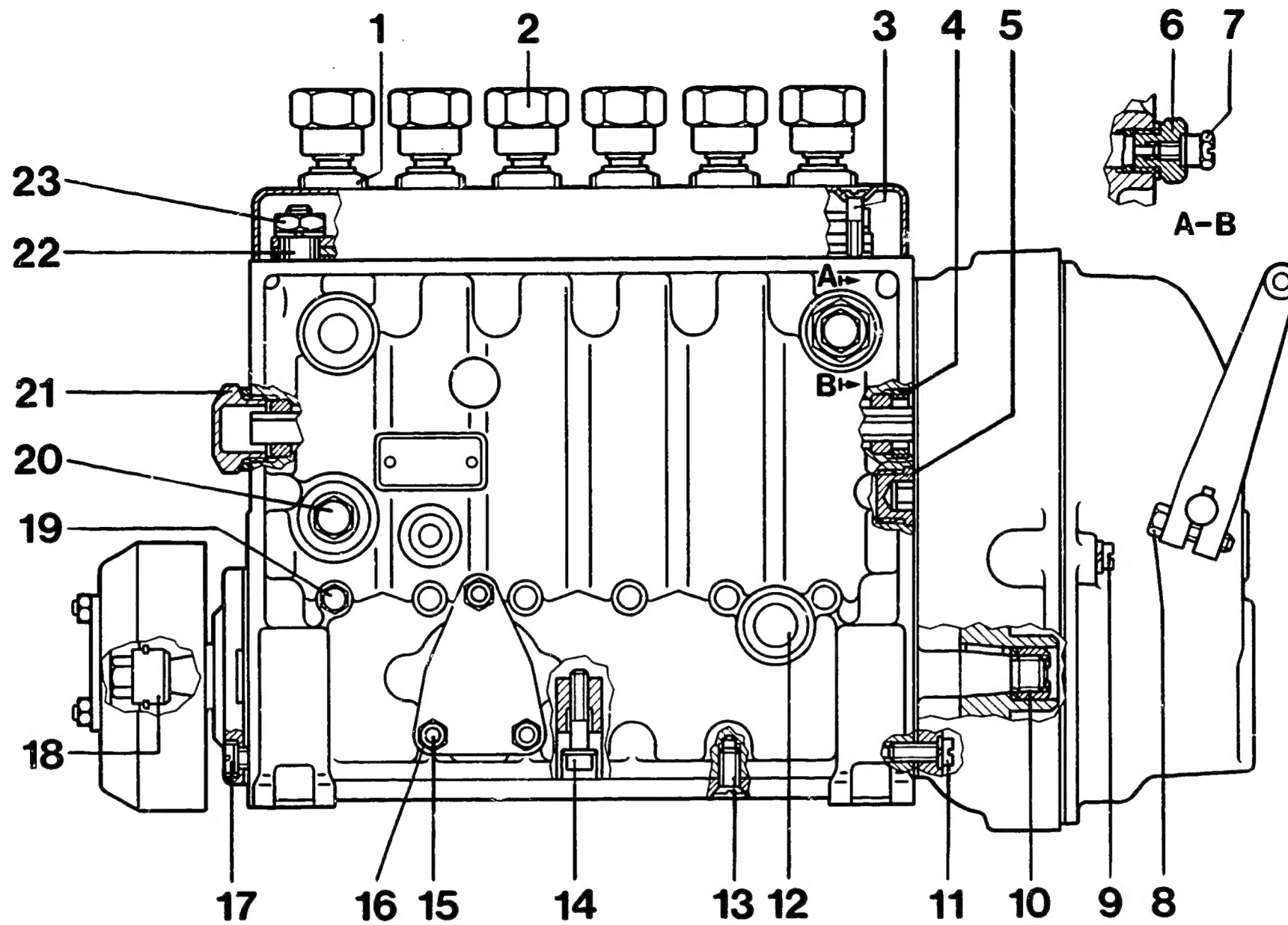
2.1 TIGHTENING TORQUES FOR PE(S)..P.. - FUEL-INJECTION PUMPS

The applicable tightening torques for PE(S)..P.. fuel-injection pumps are given on the following Coordinates.

Screws, nuts etc. are itemized on drawings on the following Coordinates.

These items are repeated at the bottom of the list and an indication is given of the Coordinates where the respective tightening torque can be found.

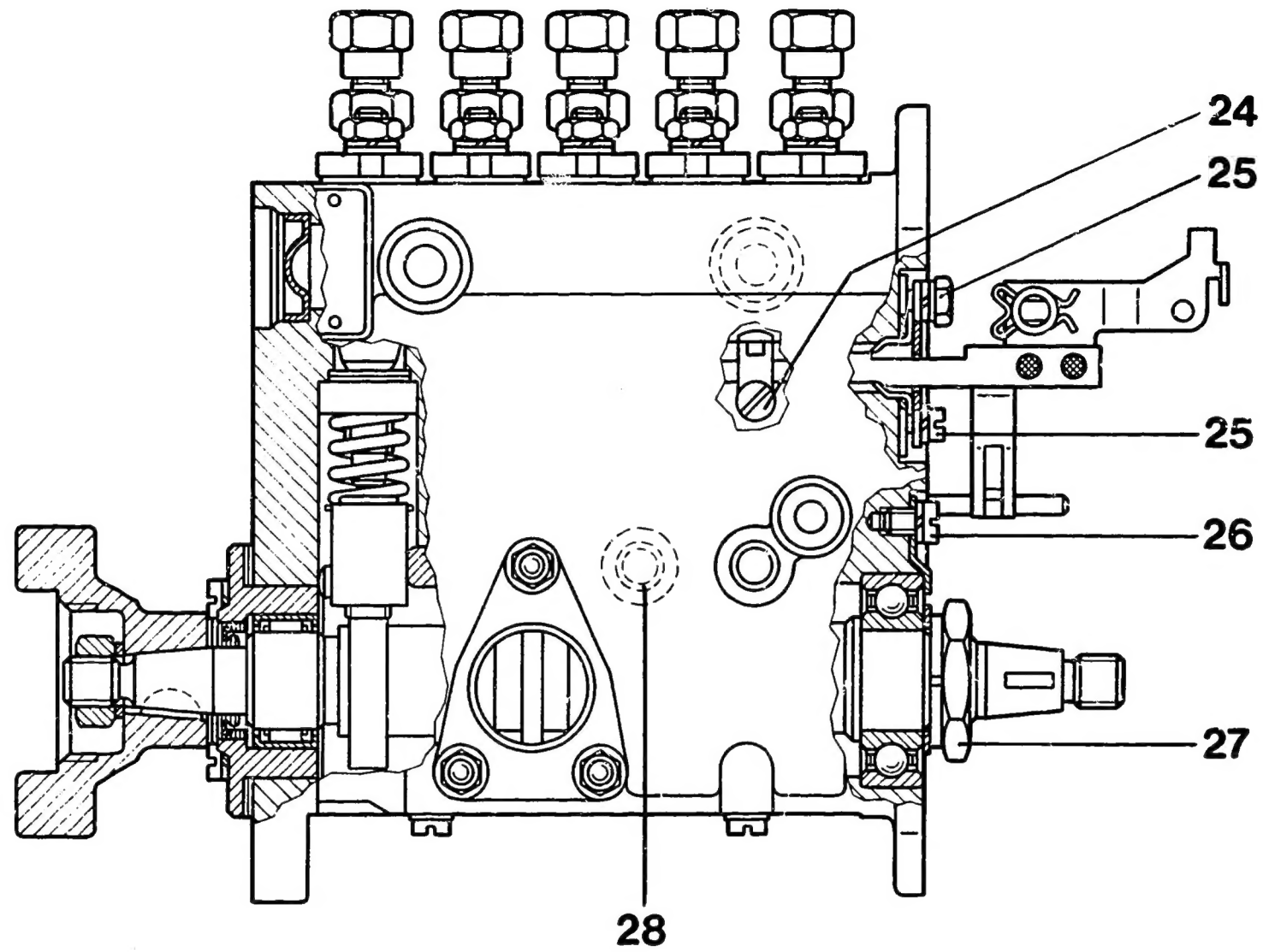




400/087

TIGHTENING TORQUES FOR PE(S)..P.. - FUEL-INJECTION PUMPS (CONTINUED)

Item	Coordinates	Item	Coordinates	Item	Coordinates
1	A17	9	A17	17	A19
2	A17	10	A18	18	A20
3	A17	11	A18	19	A20
4	A17	12	A18	20	A20
5	A17	13	A18	21	A20
6	A17	14	A19	22	A20
7	A17	15	A19	23	A21
8	A17	16	A19		



400/088

TIGHTENING TORQUES FOR PE(S)..P.. - FUEL-INJECTION PUMPS (CONTINUED)

Item	Coordinates
24	A21
25	A21
26	A21

Item	Coordinates
27	A21
28	A21



TIGHTENING TORQUES FOR PE(S)..P.. (CONTINUED)

ITEM 1 - Delivery-valve holder

Type	Thread	Nm
PE(S)..P../..	M 26 x 1.5	65...80
PE(S)..P..A..	M 26 x 1.5	60-0-60-0- 80...90
PE(S)..P..S 6000..	M 22 x 1.5	110...120
PE(S)..P..S 7000..	M 22 x 1.5	110...120

ITEM 2 - Union nut

Type	Thread	Nm
PE(S)..P..	M 14 x 1.5	max. 25

ITEM 3 - Flat-head screw 2... 3 Nm

ITEM 4 - Control-rod guide bushing 30...40 Nm

ITEM 5 - Screw plug

Type PE(S)..P 40...50 Nm

ITEM 6 - Threaded bushing 20...30 Nm

ITEM 7 - Bleeder screw 4... 5 Nm

ITEM 8 - Control-lever clamping screw 11...13 Nm

ITEM 9 - Governor-cover fastening screw

Type	Thread	Nm
RQ..K	M 6	5... 7
	M 8	11...16

TIGHTENING TORQUES FOR PE(S)..P.. (CONTINUED)

ITEM 10 - Mechanical governor

Type	attached to	Thread	Nm
RQ..K	PE(S)..P..	M 12 * **	50... 60 65... 75

ITEM 11 - Governor fastening screw

Type	Thread	Nm
PE(S)..P.. with flat-head screws	M 6	6... 8
w.fillister-head screws	M 6	7... 9

\* = Flyweight assemblies with lubricating spiral and hole at drive hub, as well as without holes in universal joint

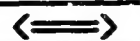
\*\* = Flyweight assemblies without lubricating spiral and hole at drive hub, as well as with two holes in universal joint

ITEM 12 - Reducer bushing

	Thread	Nm
	M 14 x 1.5	20...25
	M 16 x 1.5	30...40

ITEM 13 - Base-plate fastening screw

Type	Thread	Nm
PE(S)..P..	M 6 (Slotted flat-head screw)	6... 7
	M 6 (Hex.-socket flat-head cap screw)	7... 9
	M 6 (Hexagon-socket-head cap screw)	7... 9



TIGHTENING TORQUES FOR PE(S)..P.. (CONTINUED)

ITEM 14 - Fillister-head screw for intermediate bearing

Type	Thread	Nm
PE(S)..P..	M 6	7... 9 for alum. bearing 8...10 for steel-bearing.

ITEM 15 - Threaded pin

Type	Thread	Nm
PE(S)..P..	M 6	3.5...4.5

ITEM 16 - Hexagon nut

Type	Thread	Nm
PE(S)..P..	M 6	7... 9

ITEM 17 - Bearing-cap fastening screw

Type	Thread	Nm
PE(S)..P..	M 6 Fillister-head screw	9...12
	M 6 Torx fillister-head screw	10...12
	M 8 Torx fillister-head screw	18...20
	M 6 Hexagon-socket-head cap screw	10...12
	M 8 Hexagon-socket-head cap screw	18...20

TIGHTENING TORQUES FOR PE(S)..P.. (CONTINUED)

ITEM 18 - Timing device and couplings

Type	Cone dia.	Thread	Nm
PE(S)..P.. Round nut	17 mm	M 12	60... 70
	20 mm	M 14 x 1.5	85...100
	25 mm	M 18 x 1.5	100...110
Hexagon nut	20 mm	M 14 x 1.5	65... 75
	25 mm	M 18 x 1.5	100...110
	30 mm	M 20 x 1.5	150...170
	35 mm	M 24 x 1.5	170...200

ITEM 19 - Screw plug

8...10 Nm

ITEM 20 - Screw plug

Type	Thread	Nm
PE(S)..P..	M 24 x 1.5	40...60

ITEM 21 - Screw plug

Type	Thread	Nm
PE(S)..P..	M 24 x 1.5	40...60

ITEM 22 - Headless setscrew

Type	Thread	Nm
PE(S)..P..	M 10	25...30



TIGHTENING TORQUES FOR PE(S)..P.. (CONTINUED)

ITEM 23 - Hexagon nut

Type	Thread	Nm
PE(S)..P..	M 10	40...45

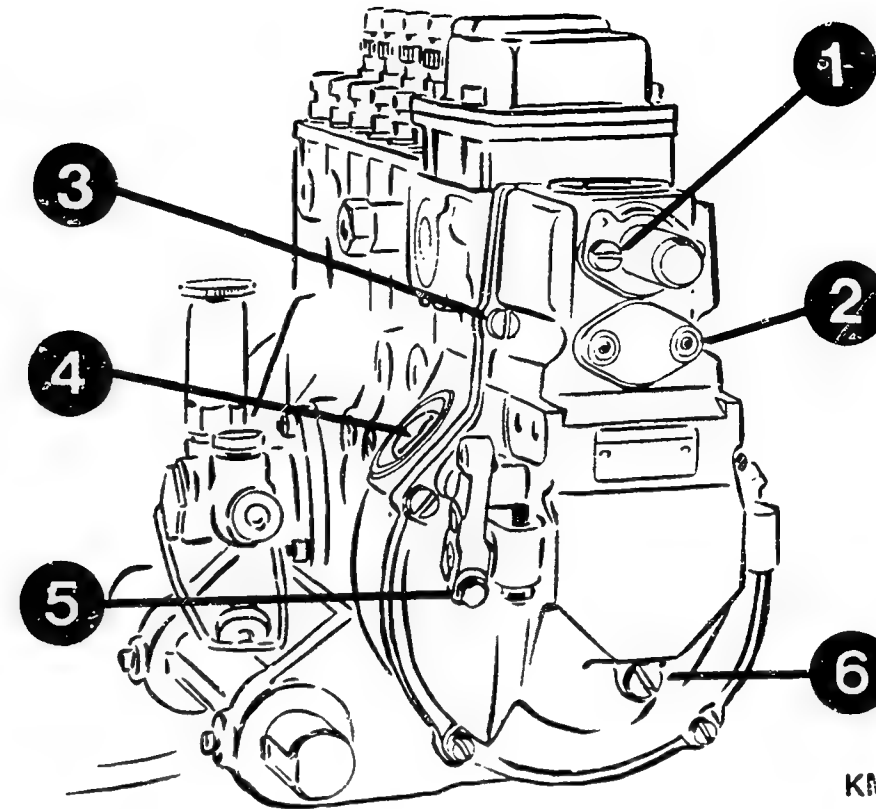
ITEM 24 - Clamping screw 3...5 Nm

ITEM 25 - Control-rod fastening screw 4...7 Nm

ITEM 26 - Fillister-head screw 4...7 Nm

ITEM 27 - Hexagon nut 100...120 Nm

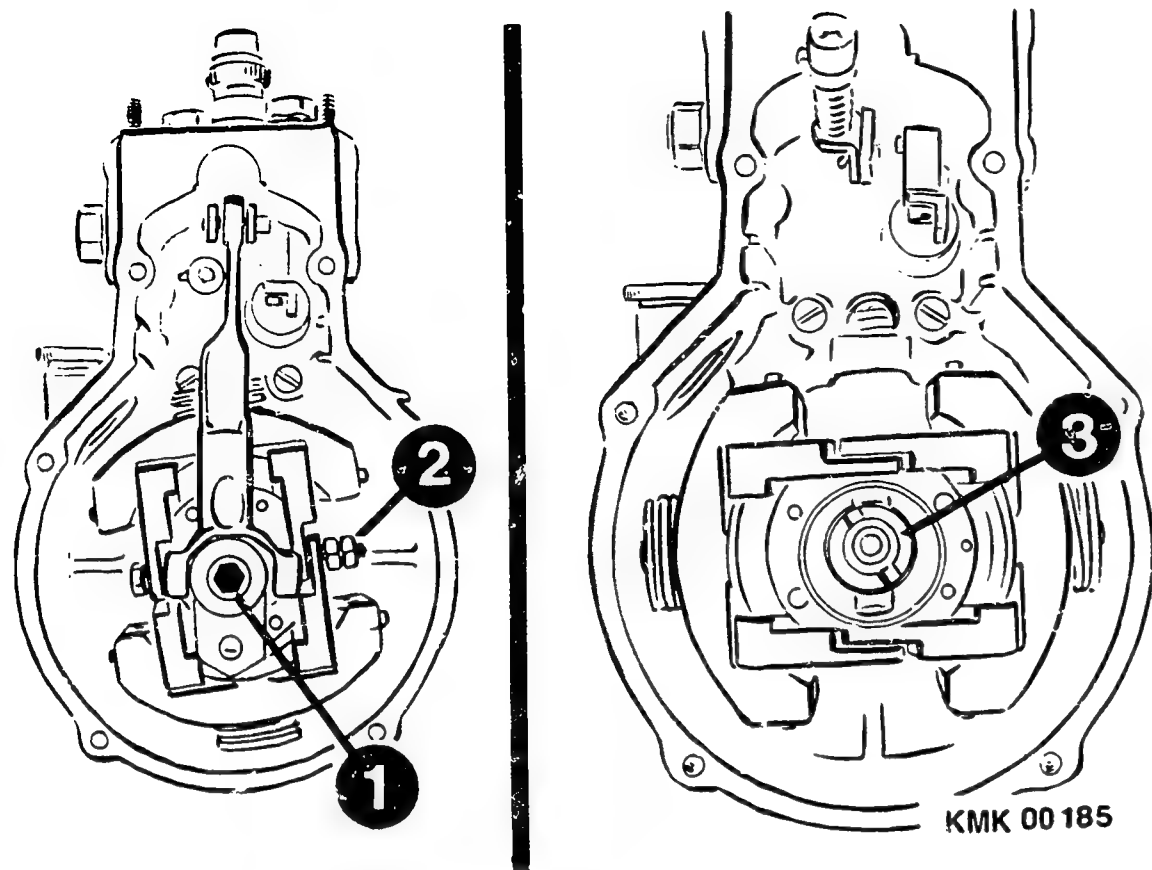
ITEM 28 - Screw plug 30... 40 Nm



KMK 00184

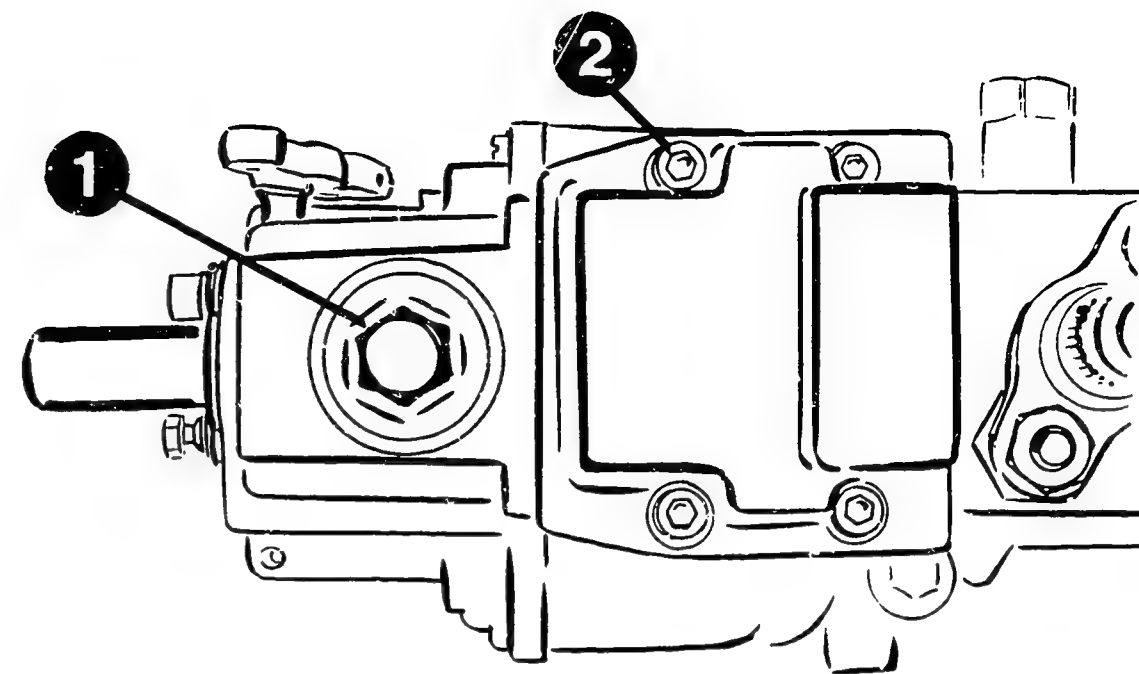
TIGHTENING TORQUES FOR RQ..K GOVERNORS

1 = Fillister-head screw	4 ... 6 Nm
Break-off screw	2 ... 3 Nm
2 = Hexagon-socket-head cap screw	7 ... 9 Nm
3 = Fillister-head screw	7 ... 9 Nm
4 = Screw plug	30 ... 40 Nm
5 = Control-lever screw	11 ... 13 Nm
6 = Guide pin	20 ... 25 Nm (with Loctite)



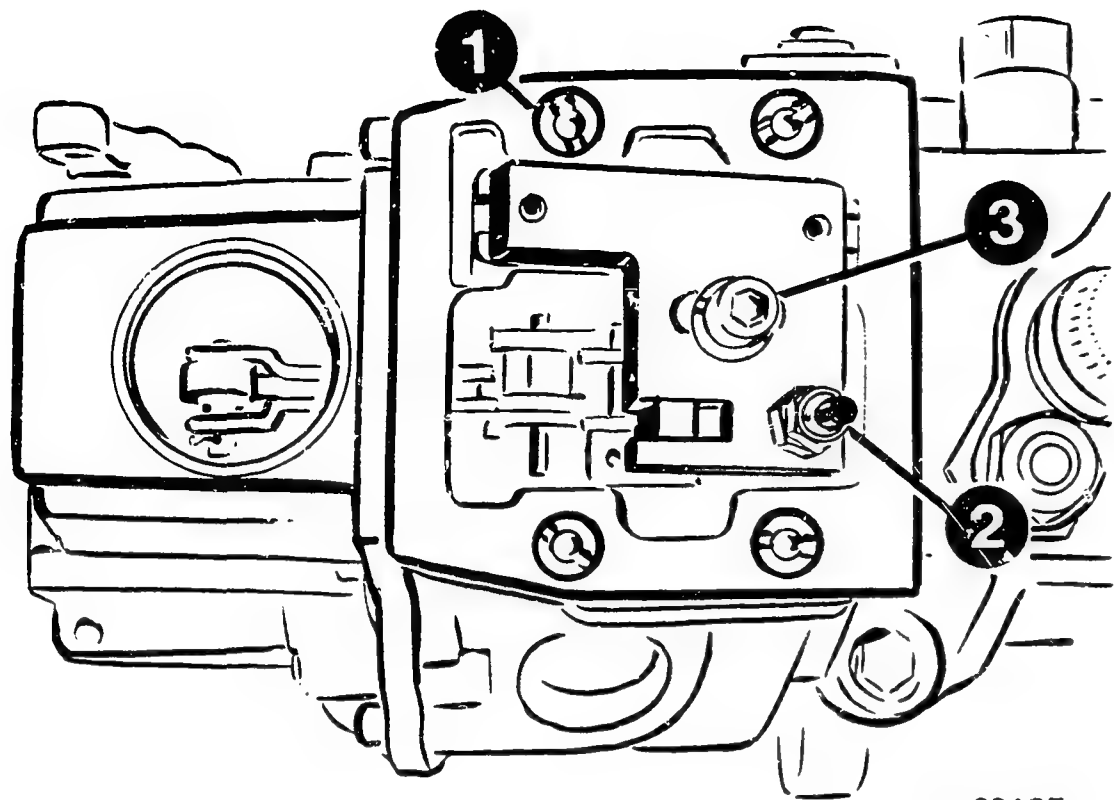
TIGHTENING TORQUES FOR RQ..K GOVERNORS  
(CONTINUED)

1 = Micro-encapsulated screw	4 ... 6 Nm
2 = Hexagon nut	6 ... 8 Nm
3 = Round nut	65 ... 75 Nm



TIGHTENING TORQUES FOR RQ..K GOVERNORS  
(CONTINUED)

1 = Screw plug	30 ... 40 Nm
2 = Hexagon-socket-head cap screw	5 ... 7 Nm

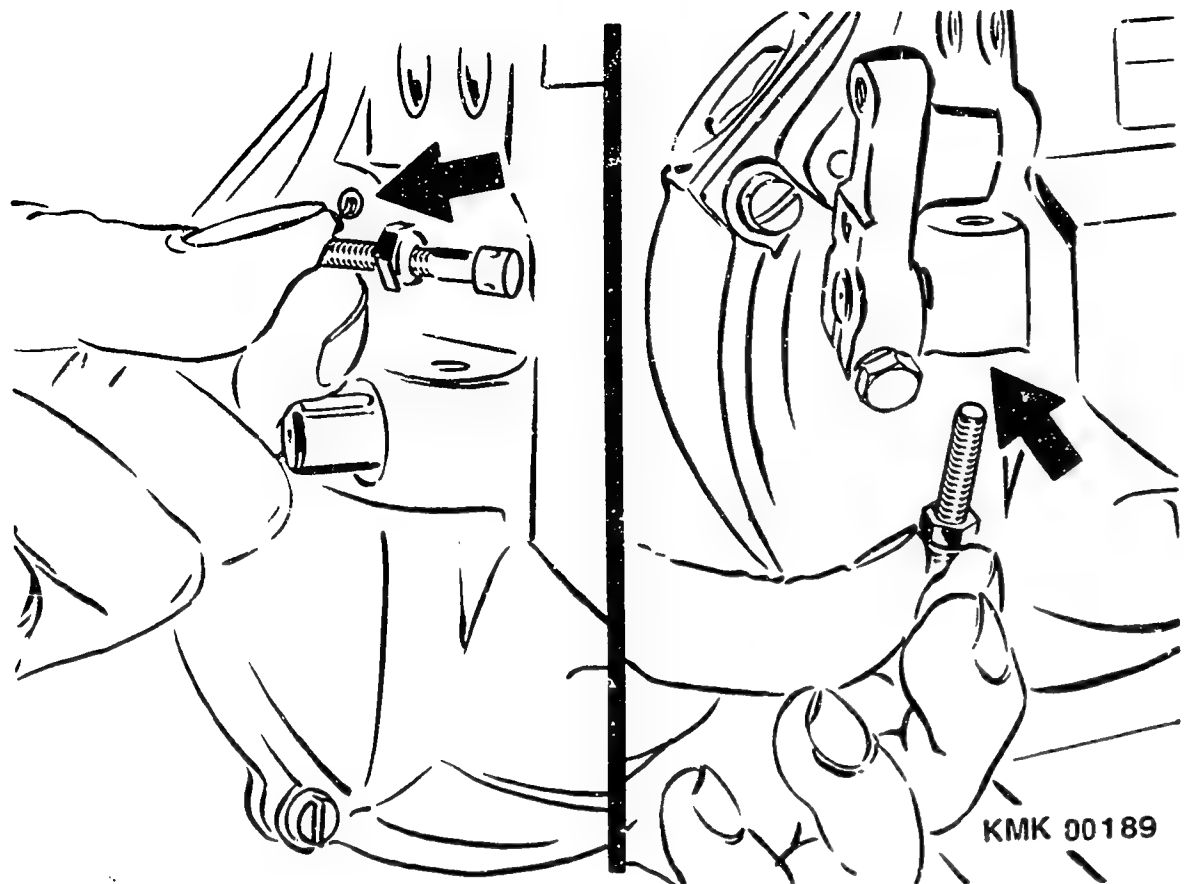


KMK 00187

TIGHTENING TORQUES FOR RQ..K GOVERNORS  
(CONTINUED)

1 = Threaded sleeve	4 ... 6 Nm
2 = Hexagon nut	6 ... 8 Nm
3 = Hexagon-socket-head cap screw	5 ... 7 Nm

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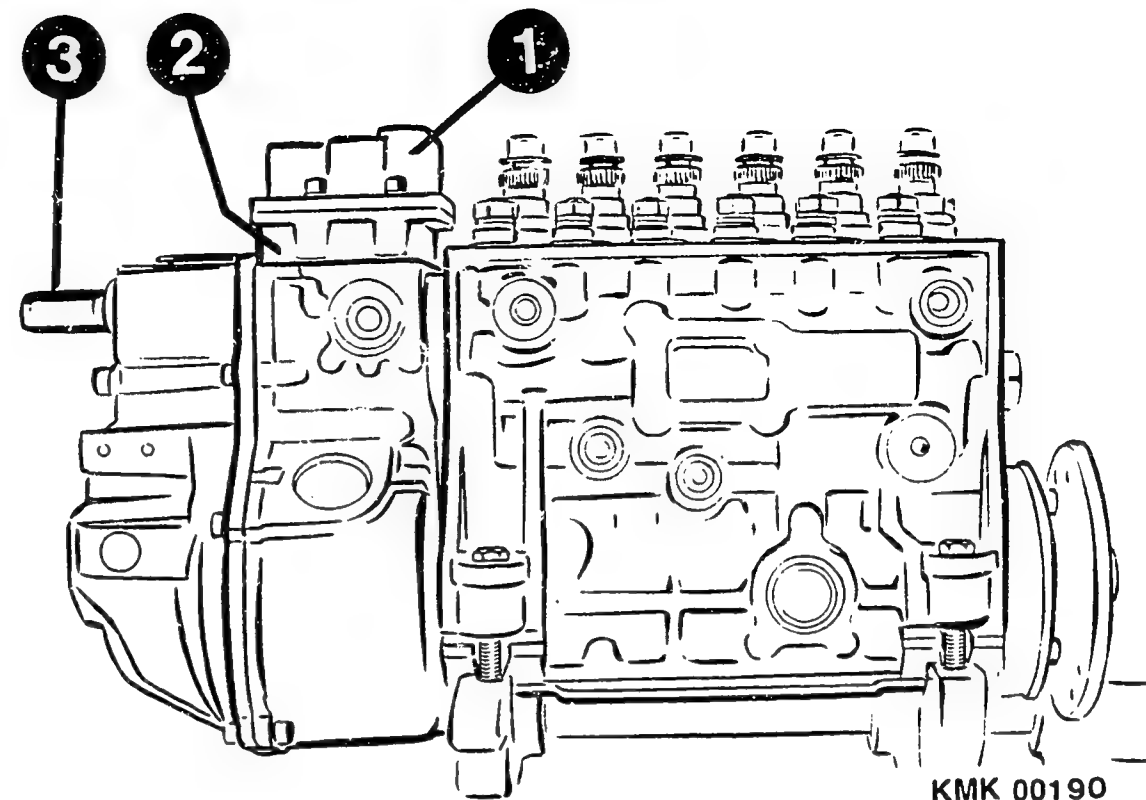


**RQ..K GOVERNOR ADJUSTMENT**

Unscrew adjusting screw for full-load delivery and shutoff stop screw of control lever.

Remove governor cover.

Remove lubricating oil which emerges.



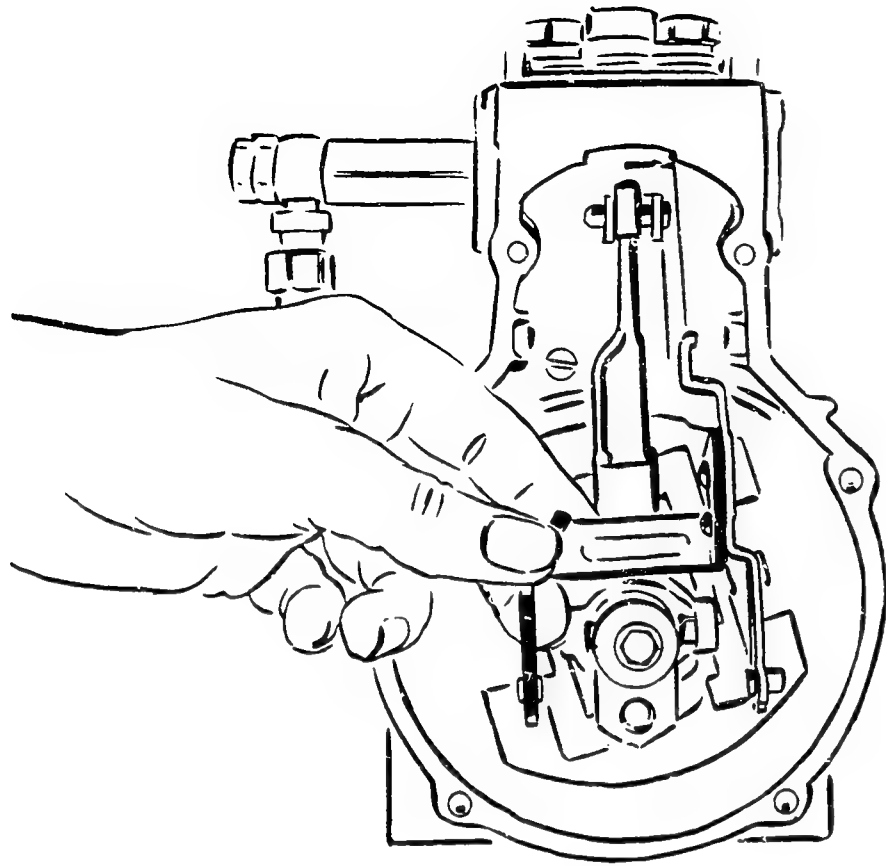
1 = Closing cover

2 = Intermediate housing

3 = Full-load stop

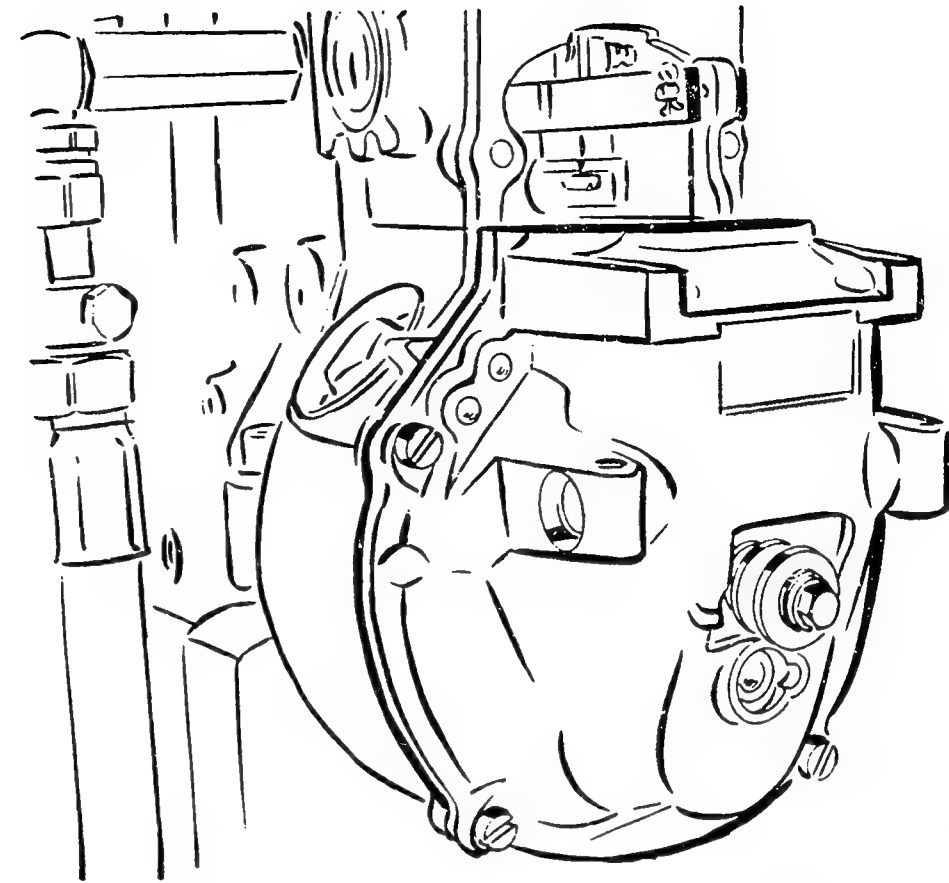
Remove closing cover, intermediate housing and, if applicable, full-load stop.





KMK 00191

Remove fulcrum lever.



KMK 00192

As a means of protection, fit a temporary governor cover (cutout).  
Pour in lubricating oil.

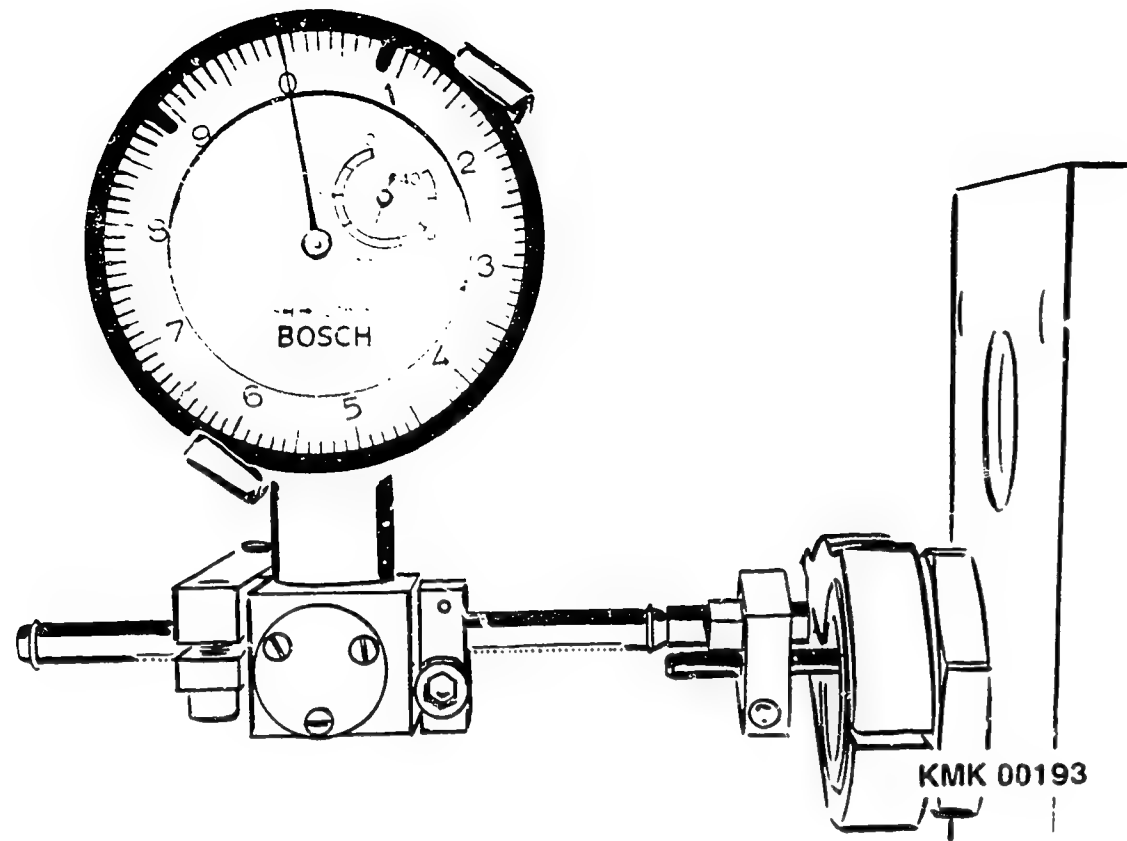
## SLIDING-SLEEVE-TRAVEL MEASUREMENT

The sliding-sleeve travel must be set with extreme care and great accuracy.

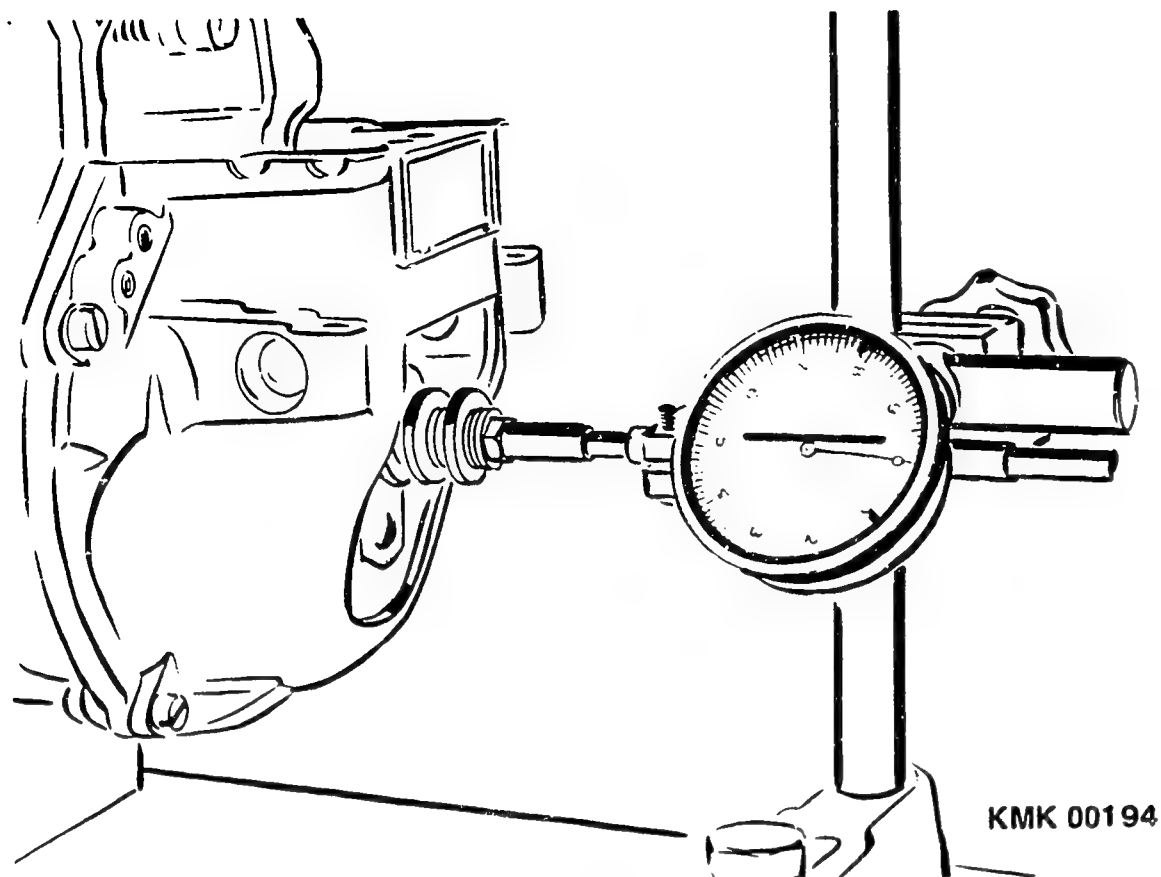
### Note:

Some of the following adjustment sequences are directly linked to the sliding-sleeve travel.

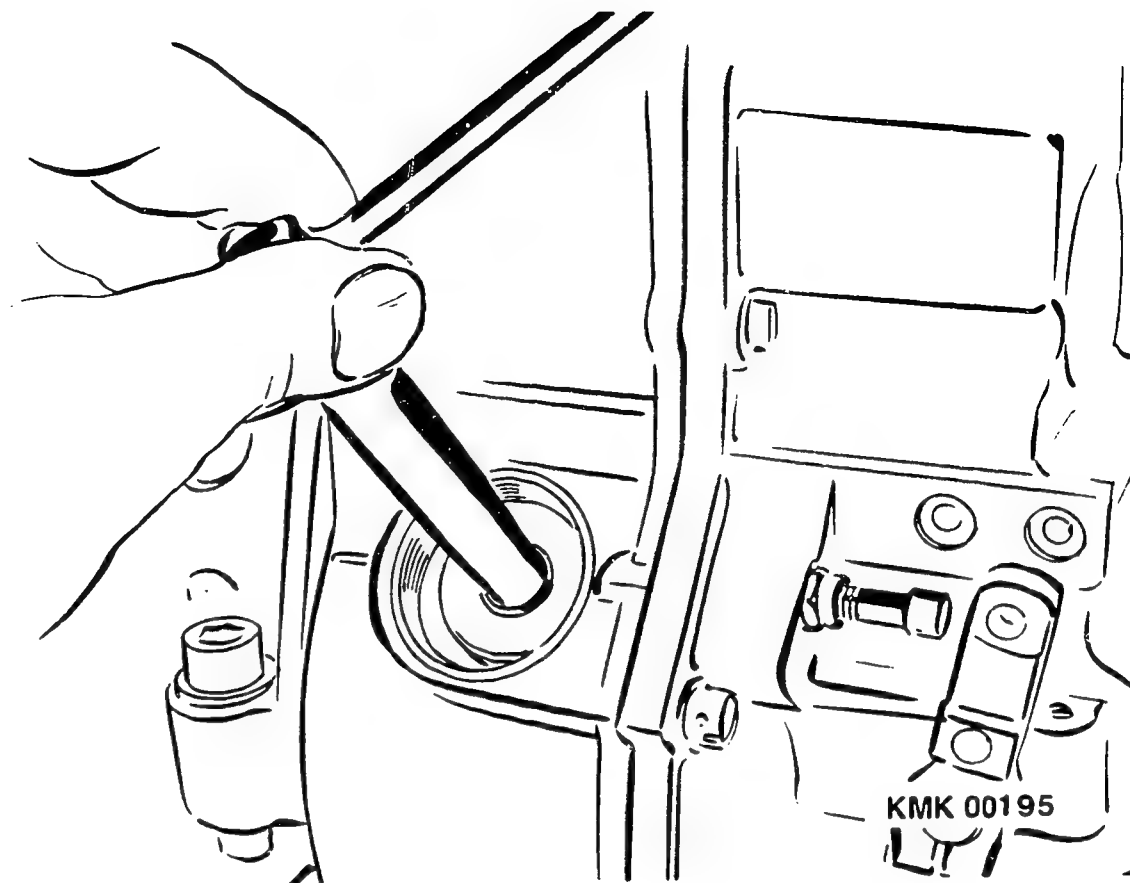
The upper and lower rated speed cannot be set in the event of incorrect adjustment.



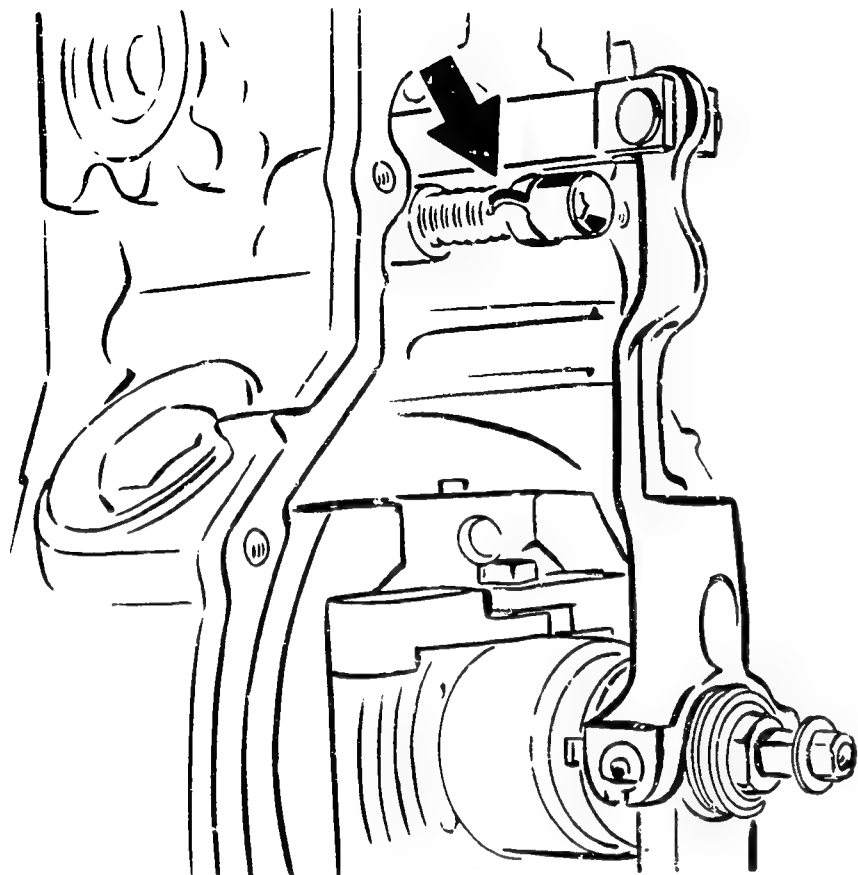
Fit control-rod-travel measuring device.



The sliding-sleeve travel as per the test-specification sheet is measured using the universal control-rod-travel measuring device 1 688 130 095.  
 The magnetic foot of the dial indicator makes contact with the micro-encapsulated screw (picture).  
 At  $n = 0 \text{ min}^{-1}$  pretension dial indicator approx. 20 mm.  
 Compensate for governor play by pulling gently on dial-indicator stem.  
 Set scale of dial indicator to "0".  
 Approach and check sliding-sleeve travel as per test specification.



If the speed determined is not within the tolerance of the indicated speeds, screw side screw plug out of governor housing and - by turning the adjusting nut of the two flyweights with the pin-type socket wrench KDEP 2989 - alter the initial tension of the flyweight springs until the prescribed sliding-sleeve travel is obtained.  
 In doing so, ensure that both nuts are evenly adjusted.  
 Maximum difference : one detent.  
 Screw screw plug back in again.

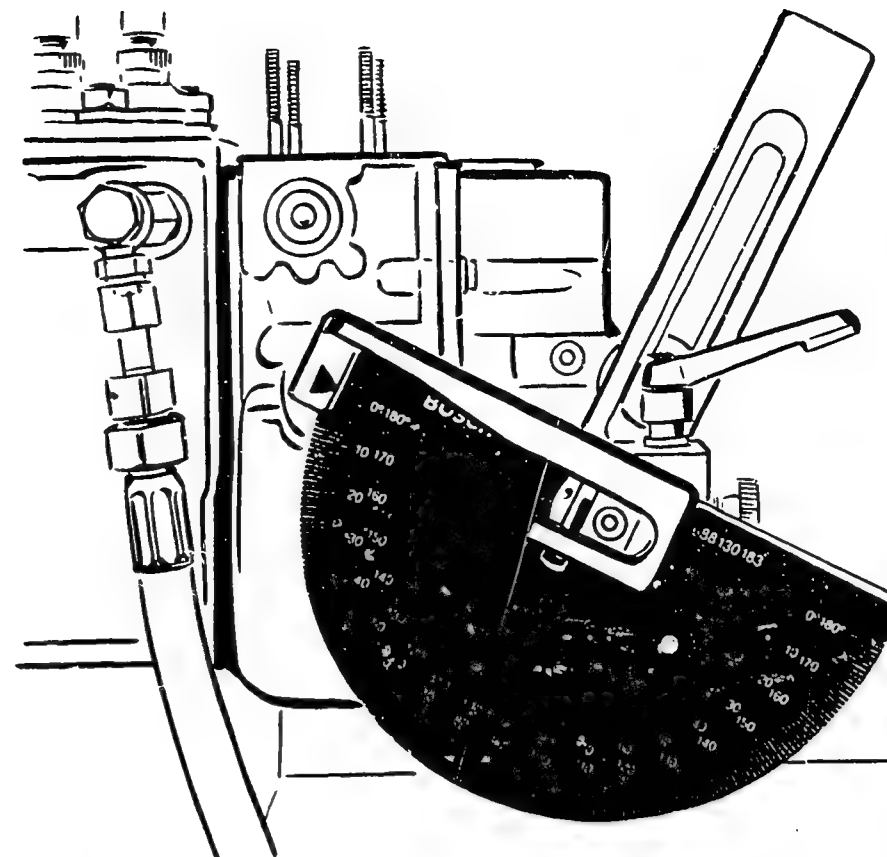


KMK 00196

Remove universal control-rod-travel measuring device and governor-cover cutout.  
 Catch lubricating oil which emerges.  
 Fit fulcrum lever.

In the case of governors with control-rod-travel fine adjustment, care must be taken to ensure that the marking lug (picture - arrow) is in the center position.

Fit governor cover with seal.  
 Secure slider guide screw with Loctite CVV.  
 Pour in lubricating oil.

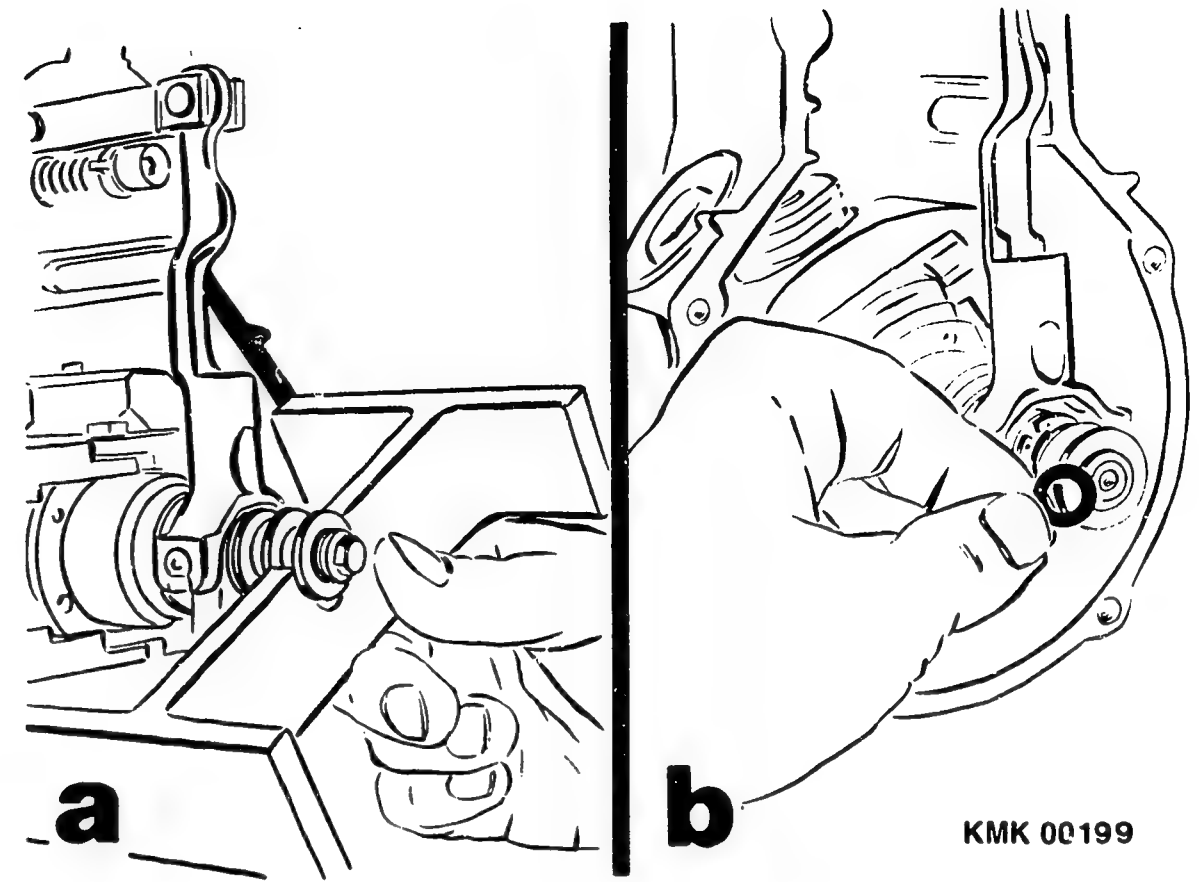


KMK 00197

MEASUREMENT AND ADJUSTMENT OF SLIDING-SLEEVE POSITION

Fit governor setting device 0 681 130 183.  
 Move control lever to shutoff position and then - from this position - slowly in direction of "FULL LOAD" again. In doing so, observe control-rod-travel measuring device. As soon as the control-rod-travel dial indicator shows - on moving the governor control lever - that the control rod is moving as well, set scale of setting device 0 681 130 183 to 0°.

Operate injection-pump assembly at prescribed speed.  
Move control lever in "FULL" direction until prescribed control-lever position has been obtained. Read off control-rod travel and compare to control-rod travel indicated in test specification.

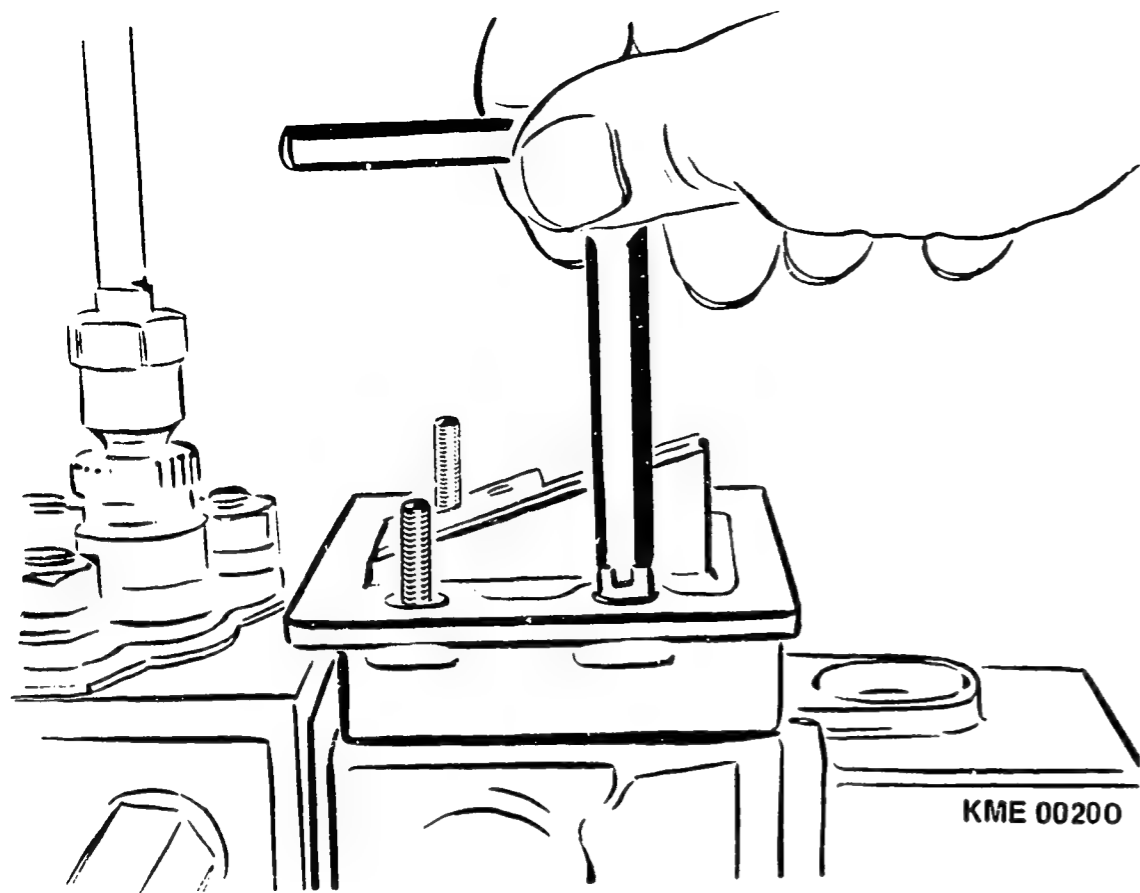


KMK 00199

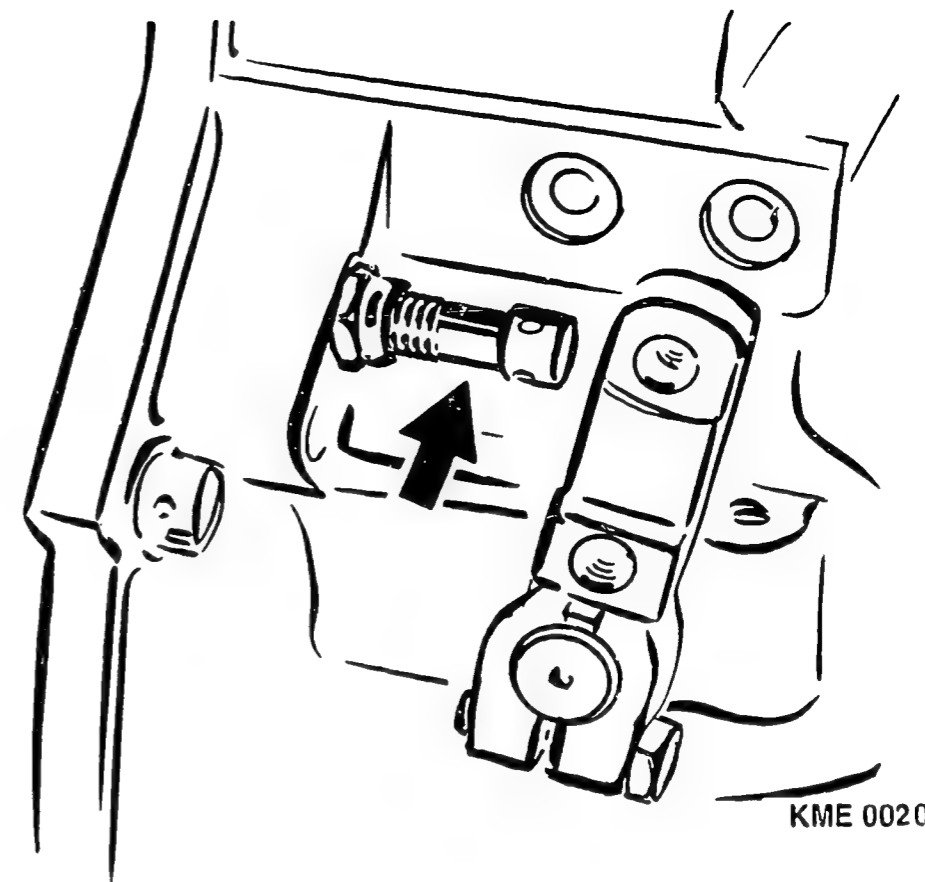
Remove governor cover if the prescribed control-rod travel is not attained.  
Check universal-joint dimension with measuring frame 1 682 329 083 (picture a).  
Loosen micro-encapsulated screw and remove guide bushing with shims.  
Adjustment is effected by changing the shims (picture b).

Following adjustment, assemble governor again and screw on governor cover.  
Screw in adjusting screw for full-load delivery and shutoff stop screw of control lever.

Note:  
ONLY use micro-encapsulated screw ONCE.



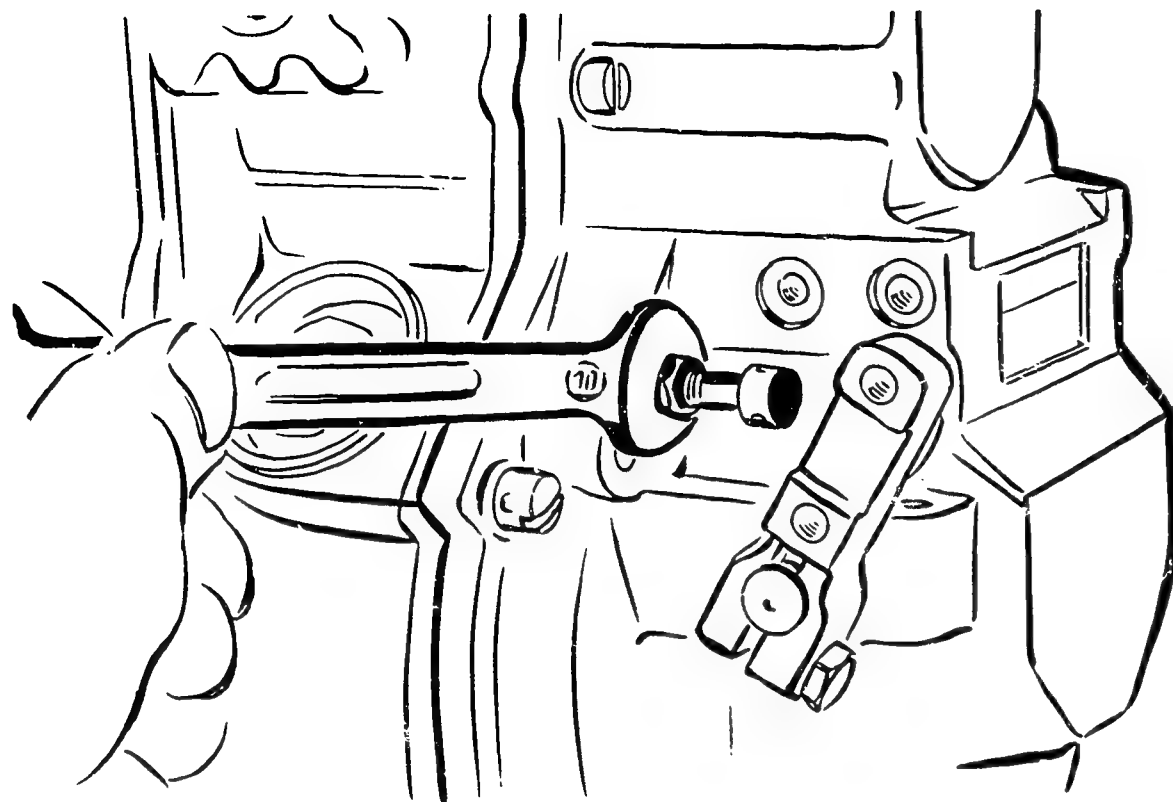
Fit intermediate housing.



#### ADJUSTING FULL-LOAD DELIVERY

Operate injection-pump assembly at prescribed speed and measure delivery. If the full-load delivery determined does not coincide with the prescribed value, the position of the control lever must be altered by way of appropriate positioning of the full-load-delivery adjusting screw until the required full-load delivery is obtained.



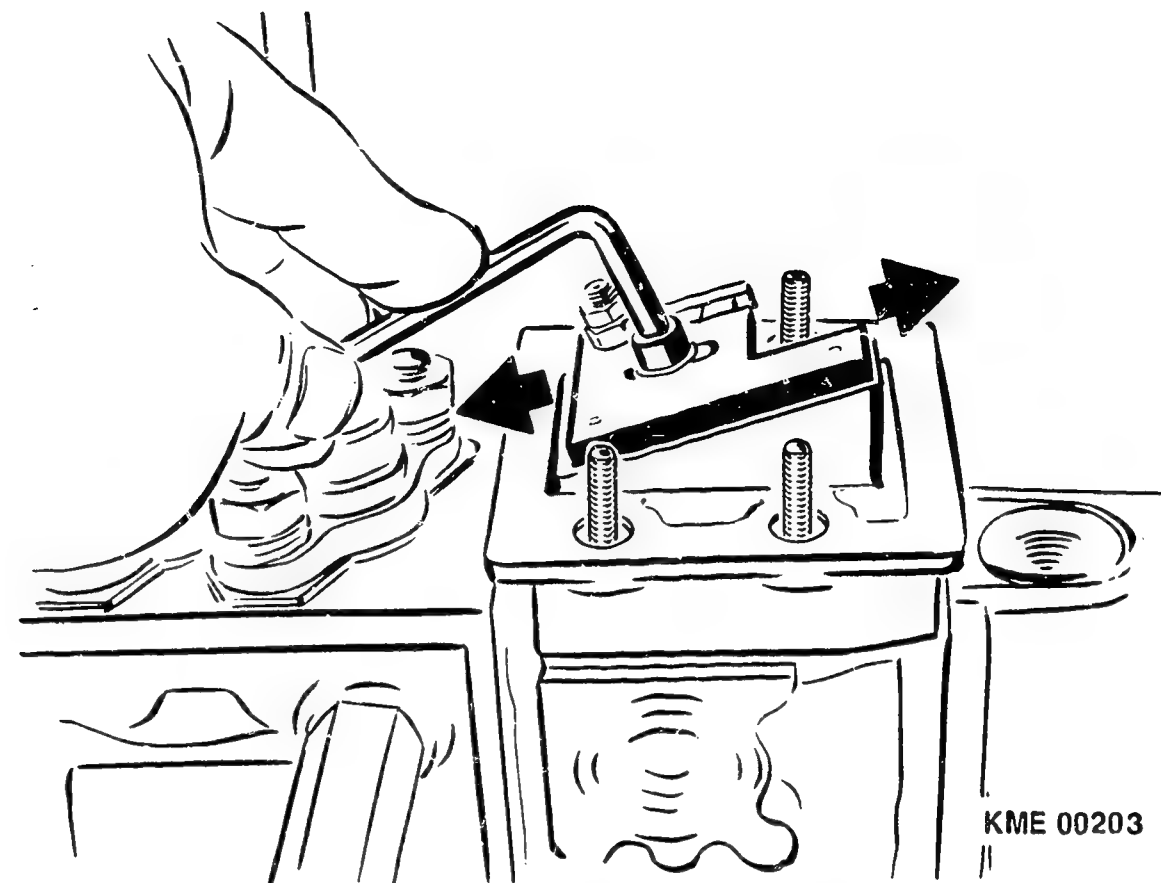


KME 00202

Effect 0.5 mm increase in control-rod travel for full-load delivery by adjusting full-load-delivery adjusting screw. Once the required control-rod travel has been obtained, tighten lock nut of full-load-delivery adjusting screw.

**Note**

The governor must not alter the full-load position of the control rod. If the position of the control rod is altered, adjustment of the sliding-sleeve travel must be repeated.

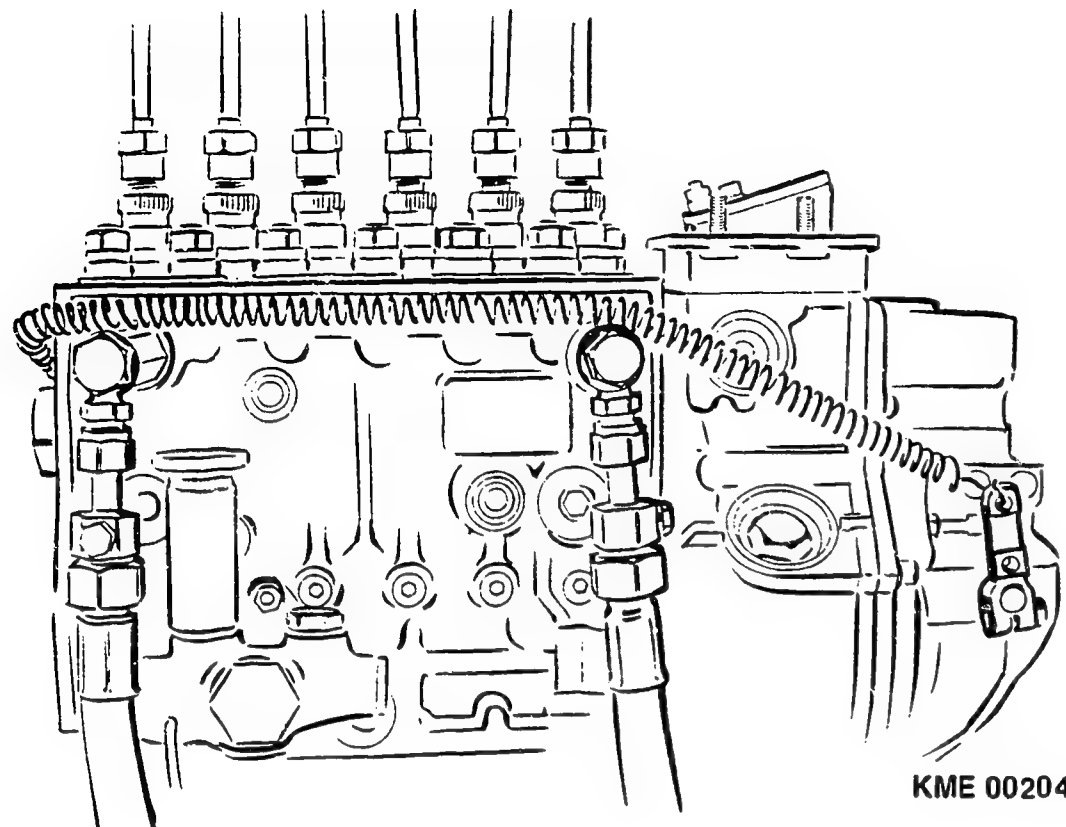


KME 00203

Insert full-load stop in intermediate housing and move it until 0.5 mm increase in control-rod travel has been eliminated again.

IN OTHER WORDS THE CONTROL-ROD TRAVEL FOR THE FULL-LOAD DELIVERY AS PER THE TEST-SPECIFICATION SHEET HAS NOW BEEN SET.

Screw in and tighten hexagon-socket-head cap screw of full-load stop. Check full-load delivery again !



KME 00204

#### SETTING UPPER RATED SPEED

Position control lever against full-load-delivery adjusting screw and secure if necessary in this position with extension spring. Slowly increase pump speed until 1st control-rod travel prescribed in test-specification sheet has been obtained. Read off speed and compare to corresponding speed in test-specification sheet.

Further increase speed until prescribed 2nd control-rod travel has been attained. Read off speed and compare to corresponding speed in test-specification sheet. If this does not coincide with the prescribed speed, the sliding-sleeve travel must be re-checked or adjusted again. If correction cannot be effected by way of the procedure prescribed, the complete fly-weight spring set is to be replaced with a new set of springs.

Repeat governor adjustment.

If further control-rod travels and speeds are prescribed, these are then to be checked. The speed tolerance must be reached with increasing and decreasing speeds.

## SETTING LOWER RATED SPEED

Operate pump at prescribed speed for setting point.

Move control lever from full-load position in "shutoff" direction until corresponding control-rod travel has been obtained.

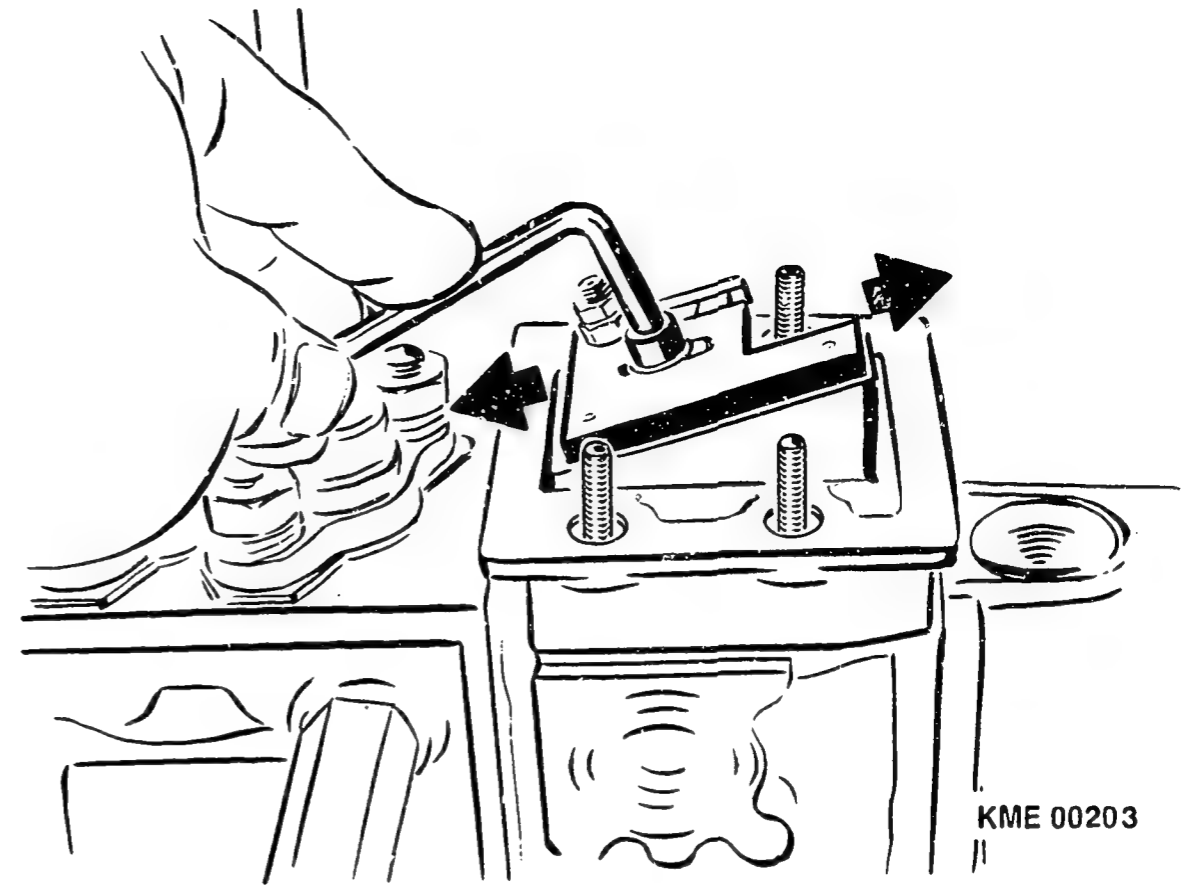
Lock control lever in this position and check whether the corresponding control-rod travels are obtained at the prescribed speeds.

If these do not coincide with the prescribed speed, the sliding-sleeve travel must be checked again or re-adjusted.

If shims under the idle spring are prescribed in the service-parts list, value correction can be carried out by selecting the appropriate shim.

If the procedure described does not make it possible to effect correction, the complete flyweight spring set is to be replaced with a new set of springs.

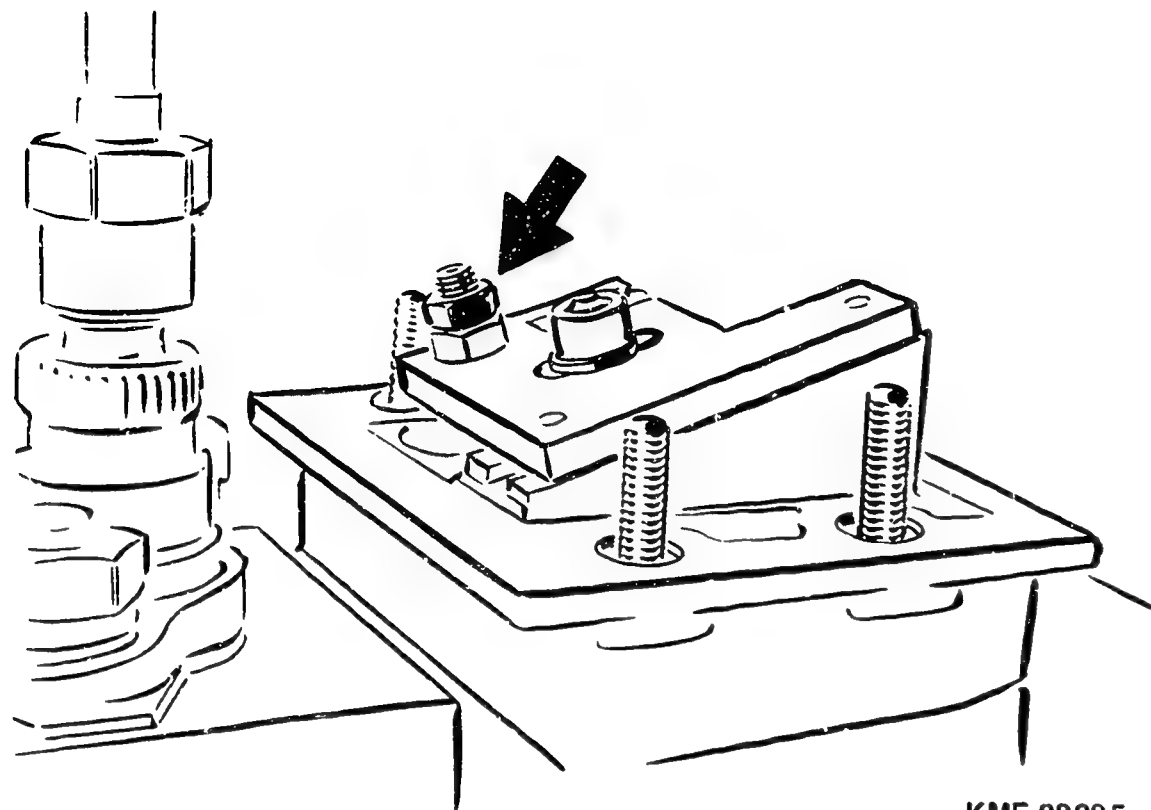
Repeat governor adjustment.



## TESTING AND ADJUSTING TORQUE CONTROL

Set the 1st speed indicated under "torque control" in the test-specification sheet. Check the control-rod travel corresponding to this speed.

In the event of a deviation, open hexagon-socket-head cap screw and move full-load stop until control-rod travel has been adjusted. Lock hexagon-socket-head cap screw.

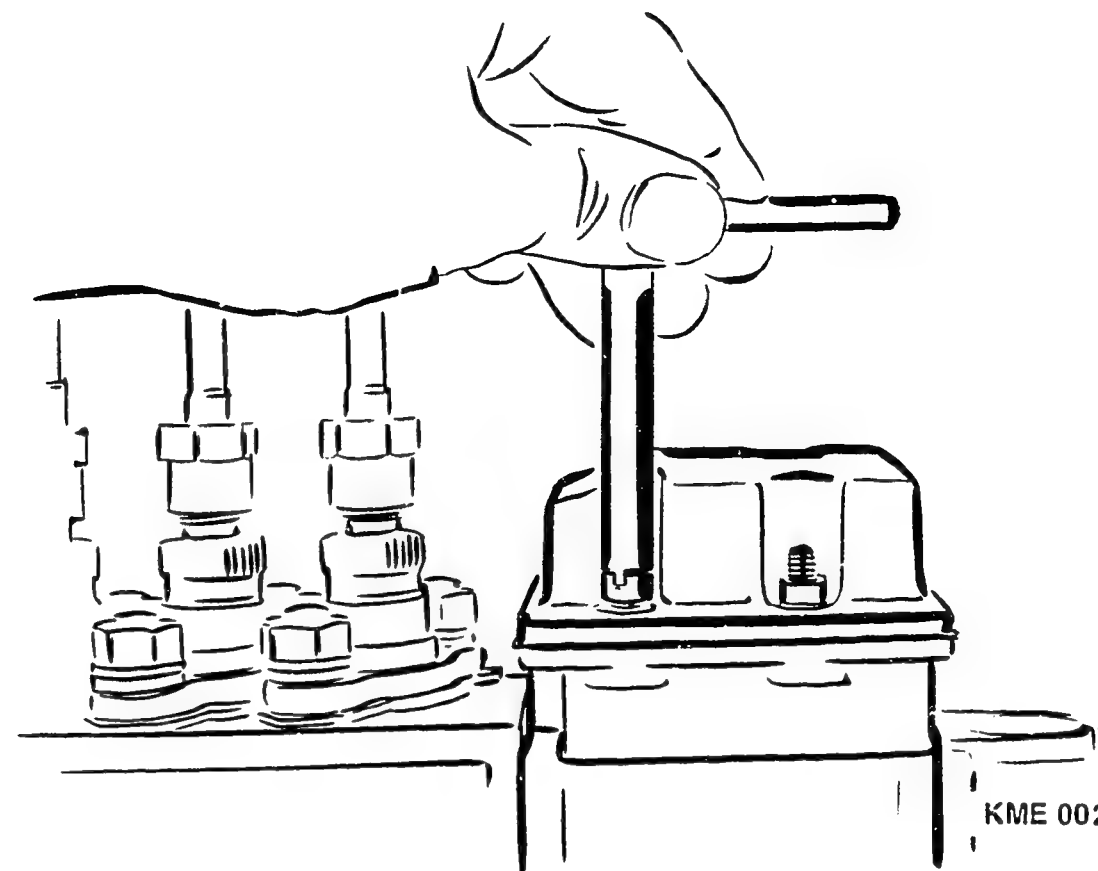


KME 00205

Set 2nd and 3rd speed and check corresponding control-rod travels.  
 If these do not coincide with the test-specification sheet, the height of the cam must be adjusted at the headless setscrew (arrow) of the full-load stop.

Set the 1st speed indicated under "torque control" in the test-specification sheet. Check the control-rod travel corresponding to this speed.  
 In the event of a deviation, open hexagon-socket-head cap screw and move full-load stop until control-rod travel has been set. Lock hexagon-socket-head cap screw. Repeat the described test step for the 2nd and 3rd speed.

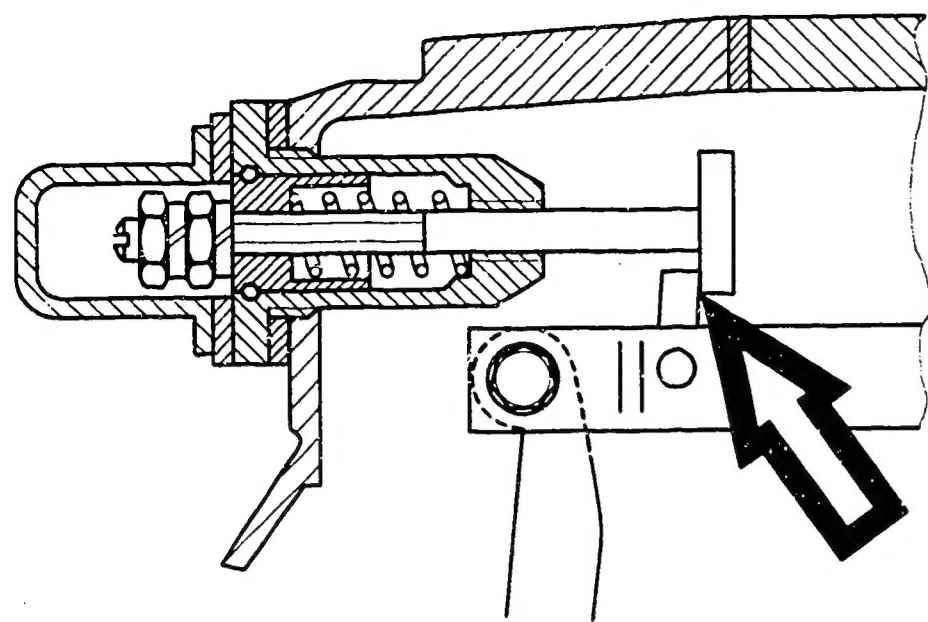
**Note:**  
 The test steps described must be repeated until all three control-rod travel values correspond to the test-specification sheet.



KME 00206

Fit closing cover (picture).

Set control rod at  $n = 0 \text{ min}^{-1}$  to full-load control-rod travel plus additional control-rod travel of 0.5 mm; control rod is then to be locked.



KMK 00207

Fit control-rod stop if provided.  
Control-rod stop must be set such that  
stop surface and travel-limiting lug of  
control rod (arrow) make contact.



KME 00208

#### ADJUSTING SHUTOFF STOP

The shutoff stop screw is to be set  
to 0.5...1.0 mm control-rod travel  
before "SHUTOFF".

Tighten locking nut.

ADJUSTING STARTING FUEL DELIVERY/STARTING CONTROL-ROD TRAVEL

Operate injection-pump assembly at prescribed speed.  
Move control lever from "SHUTOFF" to "FULL".  
Check starting fuel delivery/starting control-rod travel.

If the value does not tally with the test-specification sheet, use must be made on the pump drive end of a different screw plug for limiting the control-rod travel.

Fit closure on control-rod stop (if provided).

CHECKING FREEDOM OF MOVEMENT

Lock control lever in idle position. Operate pump at idle speed and read off control-rod travel.

When moving control rod by hand towards "FULL" and towards "SHUTOFF", control rod must rapidly return to starting point (+/- 0.2 mm) on being released.



## CONCLUDING WORK

### Fitting lead seal

Tighten screws and lock nuts.

Pay attention to tightening torques!

Secure stop screws with paint or wire and fit lead seal. If securing features were visible in the initial state, fit corresponding securing features again.

Make repair stamp and workshop mark.

### I m p o r t a n t !

In the case of any subsequent changes to the full-load delivery and/or speed, the repair stamp and workshop mark must be renewed!

Remove injection-pump assembly from injection-pump test bench. Fit supply pump and - where required - timing device.

## TESTING CAMSHAFT, SPRING AND GOVERNOR SECTION FOR LEAKAGE

Supply the compressed air required for leak testing to the pump camshaft section at a suitable location (e.g. oil check hole).

Immerse fuel-injection pump perpendicularly in test bath.

### Test duration and test pressure

P-pumps:           7 minutes at 1.5 bar, then  
                  1 minute at 0.5 bar

Then visually inspect to establish whether all sealing surfaces, screw connections, sealing rings and end covers at the housing and cover are leakproof.

In order to avoid possible skin irritation, apply hand cream beforehand and wash with water and hand cleanser following completion of test.

Use rubber gloves if possible.

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